Assistive Free-Flyers with Gecko-Inspired Adhesive Appendages for Automated Logistics in Space

Completed Technology Project (2016 - 2020)

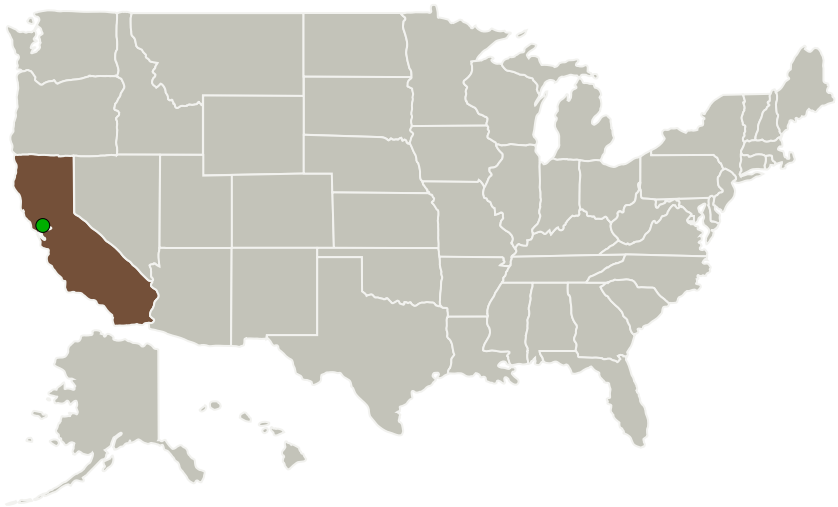
Project Introduction

Gecko-inspired adhesives provide a new capability for assistive free fliers (AFF) in space. In comparison with conventional grippers, they make it possible to attach and detach from surfaces with very low effort, simplifying control and motion planning for grasping and manipulating objects. The research includes (i) design and analysis of new adhesive grasping appendages, (ii) development and testing of new algorithms that leverage the adhesive capabilities for coordinated AFF motion planning and control and, (iii) testing prototypes in representative operations on zero-gravity test beds. The work aims to greatly reduce human time spent unpacking supplies, fetching tools and positioning and reading sensors inside space vehicles. It also paves the way for future extravehicular maintenance and exploration tasks.

Anticipated Benefits

In comparison with conventional grippers, Gecko-inspired adhesives make it possible to attach and detach from surfaces with very low effort, simplifying control and motion planning for grasping and manipulating objects. This work aims to greatly reduce human time spent unpacking supplies, fetching tools and positioning and reading sensors inside space vehicles. It also paves the way for future extravehicular maintenance and exploration tasks.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Stanford University(Stanford)	Lead Organization	Academia	Stanford, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Website:

https://www.nasa.gov/strg#.VQb6T0jJzyE

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Stanford University (Stanford)

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

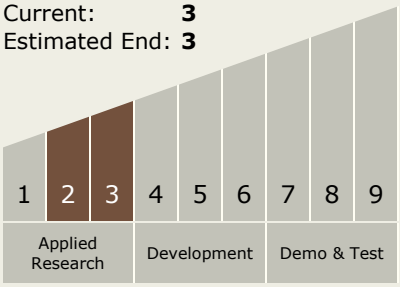
Hung D Nguyen

Principal Investigator:

Mark R Cutkosky

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.3 Manipulation
    - TX04.3.2 Grappling Technologies

Target Destinations

The Moon, Earth